PROPOSED PLAN FOR AMENDMENT TO THE RECORD OF DECISION
CONTINENTAL STEEL SUPERFUND SITE
FINAL REMEDIAL ACTION

SUMMARY FOR THE PROPOSED AMENDMENT TO THE RECORD OF DECISION

I. Purpose of Proposed Amendment

The purpose of this proposed amendment is to:

- Incorporate remedial action goals that were initially developed and presented in the Baseline Human Health Risk Assessment (BHHRA) and adjusted in accordance with results of the review performed by the National Remedy Review Board (NRRB)in 1997.

- Amend the Record of Decision (ROD) to incorporate a more stringent remedial action goal for Polychlorinated Biphenyls (PCBs) in Kokomo and Wildcat Creeks based upon a recent evaluation of background levels performed in 2001 by EPA.

- Amend the ROD to incorporate the new Maximum Contaminant Level (MCL) for Arsenic as a groundwater cleanup goal.

- Formalize the re-organization of the project management strategy from the former geographic approach that divided the site into six Operable Units (OUs), to a task-based approach based upon similar remedial action activities.

II. Site Name, Location, and Description

The Continental Steel Superfund Site (CSSS) is an uncontrolled hazardous waste site located in Kokomo, Indiana. The Indiana Department of Environmental Management (IDEM) was the lead agency responsible for conducting the Remedial Investigation and Feasibility Study (RI/FS) under a cooperative agreement with the United States Environmental Protection Agency (EPA) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), commonly known as Superfund.

CSSS is located on West Markland Avenue in the City of Kokomo, Township 23 North, Range 3 East, and Township 24 North, Range 3 East, of Howard County, Indiana. The total site encompasses approximately 183 acres and consists of an abandoned steel manufacturing facility (Main Plant), pickling liquor treatment lagoons (Lagoon Area), a former waste disposal area (Markland Avenue Quarry), and a former waste disposal and slag processing area (Slag Processing Area).

Throughout its history, the plant produced nails, wire, and wire fence from scrap metal. Operations included reheating, casting, rolling, drawing, pickling, annealing, hot-dip galvanizing, tinning, and oil tempering. The steel manufacturing operations at the plant included the use, handling, storage and disposal of hazardous materials.

V. Scope and Role of Proposed Amendment to Response Action (Six Operable Units)

The purpose of this proposed Amendment to a Record of Decision (AROD) is to amend the "U.S. Environmental Protection Agency, Indiana Department of Environmental Management, Superfund Record of Decision, Continental Steel Corporation Superfund Site, Kokomo, Howard County, Indiana, September 1998 (ROD)." The final remedy is to control sources and prevent the further migration of contaminants. The final remedy for the six operable units addresses all media and migration pathways that are considered to present an unacceptable risk, including contaminated soils, waste piles, sediments, sludge, and groundwater.

Record of Decision, 1998
IDEM determined that collection and treatment of shallow groundwater, collection and containment of intermediate and lower groundwater, on-site disposal of elevated contaminated solids, and placement of common soil cover over source contaminant areas is necessary at CSSS. This decision is based upon an analysis of the site risks. The decision relies on the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Site-Wide Groundwater, Lagoon Area, Wildcat and Kokomo Creeks, Markland Avenue Quarry, Main Plant, and Slag Processing Area, and the results of the pre-design investigation.

The purpose of the contaminated solids remedial action is to address potential continuing sources of contamination to the groundwater and remove those solids posing the greatest threat to human health. There is also a potential for treatment of some of the excavated soils and sediments. Elevated Volatile Organic Compounds (VOCs)-contaminated solids and elevated PCB-contaminated solids will be removed and consolidated on site in the Corrective Action Management Unit (CAMU) landfill to be constructed on the Lagoon Area. If these contaminated solids are identified as needing treatment before placement in the CAMU, then the statutory preference for treatment as a principal element of the remedy will be achieved. However, if excavated solids do not need treatment; and if treatment of the additional threats at the site is not found to be practicable, this remedy will not satisfy the statutory preference for treatment as a principal element of the remedy. The determination of whether the excavated solids require treatment would be based on testing for treatability and Toxicity Characteristic Leaching Procedure (TCLP).

The threat to human health posed by the groundwater has been initially addressed through sampling of residential drinking water wells, provision of an alternate water supply where a drinking water standard exceedence was detected, and continued monitoring. The groundwater contamination will be addressed further by this remedy by: (1) collection, treatment, containment of shallow groundwater; (2) collection and containment of intermediate and lower groundwater, including invoking a Technical Impracticability Waiver; and (3) use of institutional controls, in the form of deed and groundwater use restrictions. The Technical Impracticability Waiver was based upon the difficulty of effectively extracting chlorinated hydrocarbons from fractured bedrock. Extraction of intermediate and lower groundwater will be performed in the process of dewatering a downgradient quarry. Therefore, despite the impracticability, extracted contaminated groundwater that exceeds discharge limits will also be treated.

Five-Year Review Results
Because hazardous substances will remain at the site, IDEM conducted a five-year review in accordance with Section 121 of CERCLA to assess whether any other source control measures are necessary. The Five-Year Review results included these determinations:

1. A recent Health Consultation performed by the Indiana Department of Health (IDOH) contains a recommendation to collect current data from several residential wells, to ensure that there are no residential wells contaminated by the CSSS.

2. The City of Kokomo received a grant from EPA to perform a "Reuse Analysis of the Continental Steel Superfund Site." This analysis, which included community participation as a major component, may result in a change in the community's desired future land use for certain areas of the CSSS.

3. Remediation goals for Kokomo and Wildcat Creeks were based upon background levels. A re-evaluation of existing background levels completed in 2002 determined that current background levels are significantly lower.

4. Data indicates contamination from CSSS contributed to levels of PCBs in fish, and presents a direct contact risk to recreational users. A level five (5) fish consumption advisory is in place for Kokomo and Wildcat Creeks, designating all fish from this stream unsafe for human consumption in any amount. Fish Consumption Advisory signs were posted. No physical barrier prevents access to the creeks. Kokomo Creek runs through Highland Park. Children and adults have been observed fishing in Kokomo Creek.

5. For the purposes of the Remedial Investigation (RI), CSSS was divided into six geographical OUs. To divide work into manageable units that could accommodate incremental funding, and to achieve an overall reduction in cost through a more efficient approach, the project was re-organized into units of similar tasks. A new Remedial Design/Remedial Action (RD/RA) Implementation Strategy re-organized the project into five (5) Contract Units (CUs).

6. The chemical-specific cleanup goals were clearly defined in the BHHRA and updated in accordance with recommendations of the NRRB, however they were not identified in the ROD. In addition, some chemical-specific cleanup goals require further revision. Updated information about background levels in Kokomo and Wildcat Creeks collected during the pre-design investigation indicates that the cleanup goal for PCBs should be reduced. Review of the BHHRA indicated the need for additional Contaminants of Particular Concern (COPCs) and cleanup goals for groundwater.

7. Fences around the Acid Lagoon area and the Markland Avenue Quarry area are not intact. There is evidence of recent trespassing in both areas.

8. The BHHRA recommended further investigation of offsite residential soils in the Markland Quarry area due to the detection of dibenzo(a,h)anthracene in one offsite soil sample at a level that, if the sample was representative of off-site exposure, may exceed EPA's acceptable risk range. Insufficient data was available to make a determination. Further investigation has not been performed.

Item #1and Item #8 will be addressed through further investigation. Item #2 is being addressed through close coordination with the Re-Use Team and through updates to risk assessment information that are being developed as part of the Remedial Design. Item #4 has been addressed by posting warning signs near highly contaminated segments of the creeks. Item #7 will be addressed by the performance of fence repairs.

In order to address Item nos.3, 5, and 6, new information must be presented to the public in a Proposed Plan and the ROD must be amended. Therefore the purpose of this Proposed Plan is to appropriately address Item nos. 3, 5, and 6; to provide an opportunity for public comment and to execute an Amendment to the 1998 Final Record of Decision for the CSSS.

Because hazardous substances will remain at the site, IDEM will conduct subsequent five-year reviews in accordance with Section 121 of CERCLA to assess whether any other source control measures are necessary.

V. Evaluation of Proposed Amendments to Record of Decision

1. Incorporate Remedial Action Goals

The following remedial goals are presented herein because they were not clearly stated in the 1998 ROD. The remedial goals were developed and proposed in the BHHRA, February 28, 1997. The proposed remedial goals were submitted to the EPA NRRB and the remedial goals for sediment in Kokomo and Wildcat Creeks were subsequently revised in accordance with the NRRB recommendations. These goals are expressed in parts per billion, as micrograms per liter (ug/l) for liquid media and micrograms per kilogram (ug/kg) for solid media.

Remediation Goals for Groundwater (OU1)

Chemical	Remediation Goals (ug/l)
Acrylonitrile	2
Arochlor-1242	0.5
Arochlor 1248	0.5
1,1-dichloroethene	7
1,2-dichloroethene	70
Benzene	5
Manganese	50
Chloroform	100
Methylene Chloride	5
Perchloroethene (PCE)	5
Trichloroethene (TCE)	5
Vinyl Chloride	2

Remediation Goals for Acid Lagoon Area (OU2)

Chemical	Remediation Goals (ug/kg)
Benzo(a)anthracene	5,984
Benzo(a)pyrene	598
Benzo(b)flouranthene	5,984
Di-benz(a,h)anthracene	598
Indeno(1,2,3-c,d)pyrene	5,984
Arochlor-1242	1,000
Arochlor 1248	1,000
Beryllium	2,000
Lead	1,096,000

Remediation Goals for Sediment in Kokomo and Wildcat Creeks (OU3)

Chemical	Remediation Goals (ug/kg)
Benzo(a)pyrene	1,585
Benzo(b&k)flouranthene	1,361
Benzo(a)anthracene	1,853
Indeno(1,2,3-c,d)pyrene	930
Arsenic	19,000
Beryllium	840
Arochlor-1016	1,000
Arochlor 1242*	1,000*
Arochlor-1248*	1,000*
Arochlor-1254*	1,000*
Arochlor-1260	1,000

Background level detected for this compound was 4,867. As explained below, the selected cleanup goal was 5,000 ug/l to align with background.

On April 22 and 23, 1997, IDEM staff presented a briefing of the CSSS RI/FS and the preferred alternatives for remediation of the site based on the RI/FS, to the EPA National Remedy Review Board in San Francisco, California. The report titled "Indiana Department of Environmental Management, Continental Steel Superfund Site Focused RI/FS, Response to National Remedy Review Board Recommendations, July 1997," presented responses to the NRRB's recommendations of May 14, 1997.

Regarding the proposed actions for the creeks, the Board recommended that cleanup levels be no lower than background levels. Background levels had been determined by sampling the creeks in several locations upstream of the area affected by the site. These creeks are located in heavily industrialized areas where any discrete cleanup to levels lower than background on-site would soon be overcome by the influence of sediments from numerous off-site upstream sources of these same contaminants.

The BHHRA had proposed background or risk based cleanup goals, if higher, for all contaminants except for PCBs. The proposed cleanup goal for PCBs was set at 1 part per million (ppm) due to ecological receptors and the Level V fish consumption advisory already existing for the creeks. However, the State agreed with the recommendation to set the creek sediment cleanup goal for PCBs at the background level of 5 ppm.

Remediation Goals for Markland Quarry (OU4)

Chemical	Remediation Goals (ug/kg)
Benzo(a)anthracene	546
Benzo(a)pyrene	501
Benzo(b&k)flouranthene	779
Di-benz(a,h)anthracene	180
Indeno(1,2,3-c,d)pyrene	404
Arochlor-1248	1,000
Arsenic	19,000
Lead	400,000

Remediation Goals for Soil at Main Plant (OU5)

Chemical	**Remediation Goals (ug/kg)**
Benzo(a)anthracene	26,703
Benzo(a)pyrene	2,670
Benzo(b&k)flouranthene	26,703
Di-benz(a,h)anthracene	2,670
Indeno(1,2,3-c,d)pyrene	26,703
Arochlor-1242	25,000
Arochlor-1248	25,000
Arochlor-1254	25,000
Arochlor-1260	25,000
Lead	1,096,000

Remediation Goals for Slag Processing Area (OU6)

Chemical	**Remediation Goals (ug/kg)**
Arsenic	19,000
Lead	400,000

2. Incorporate More Stringent Remedial Action Goal For PCBs in Kokomo and Wildcat Creeks

The remediation goal of 5 ppm for Arochlors 1242, 1248, and 1254 was selected based upon the background levels in Kokomo and Wildcat Creeks as determined during the RI/FS. EPA contracted with CH2M Hill to perform pre-design investigative activities. The pre-design investigation field activities were performed from May until August 2000. The purpose of the investigations was to gather data to provide more accurate information with regard to the characteristics and volume of contaminated media at CSSS. The more accurate information would be used to develop detailed remedial design plans.

The results of the pre-design investigation with regard to the creek sediments are found in the March 2002 report titled "Evaluation of Sediments in Wildcat and Kokomo Creeks, Continental Steel Superfund Site, Kokomo, Indiana." The reevaluated background concentrations for PCBs generally were one order of magnitude lower than those calculated during the RI/FS. The reevaluated PCB background concentrations (See Appendix B Figure 2 for background sample locations) were consistent with the results from additional studies reported to EPA by IDEM in a letter for February 2000. The additional studies were conducted by IDEM staff in January 2000. Results of IDEM's additional studies indicated the background PCB levels in both Kokomo and Wildcat Creeks were non-detect. Therefore, the Evaluation of Sediments report assumed the remediation goal for the individual Arochlors to be 1,000 ug/kg.

IDEM and EPA met to discuss the issue on February 13, 2002. CH2M Hill presented three alternative scenarios for sediment cleanup, applying a risk based approach that utilized Sediment Weighted Average Concentrations (SWAC). The SWAC approach determines the average concentration of a contaminant for a particular length of a river or stream. The basis of the SWAC approach is that the "exposure domain", (the area of the creek where animals or humans might live, swim or play and might be exposed to contamination) is larger than the small areas represented by individual samples. For that reason an average concentration of the exposure domain should be used. For Kokomo and Wildcat Creeks the exposure domain includes approximately 2 miles of stream, divided into eight smaller segments called "reaches."

The creeks were divided into polygons, areas that were determined to be equal distances from a representative sample location (See Appendix B Figure 4). The scenarios were:

- Excavate all polygons with PCBs greater than 10 times the remedial goal, and PAHs greater than 10 times the remedial goal. The total estimated volume to be excavated would be 79,471 cubic feet. Total estimated capital cost is $5,730,899.

- Excavate all polygons with PCBs greater than 5 times the remedial goal, and PAHs greater than 5 times the remedial goal. The total estimated volume to be excavated would be 173,209.7 cubic feet. Total estimated capital cost is $10,169,537.

- Excavate all polygons with PCBs greater than the remedial goal, and PAHs greater than the remedial goal. The total estimated volume to be excavated would be 579,476.6 cubic feet. Total estimated capital cost is $17,734,565.

Of the three scenarios, only excavation of all polygons with PCBs greater than the remedial goals would achieve a SWAC of 1 ppm (See Appendix B Table 1). The following additional scenario was proposed in order to achieve a SWAC in all areas of the creek of less than 1 ppm in a more cost-effective manner:

- Excavate all polygons with PCBs greater than 3 times the remedial goal, and PAHs greater than 5 times the remedial goal. The total estimated volume to be excavated would be 256,212.1 cubic feet. This includes removal of four additional polygons in Wildcat Creek with concentrations that slightly less than three times the remedial goal for PCBs. Total estimated capital cost is $10,357,261 (See Appendix B Figure 3).

IDEM and EPA propose to incorporate a cleanup level for each individual Arochlor of 1ppm based upon the reevaluated background. IDEM and EPA further propose to perform sediment excavation by excavating all polygons with PCBs greater than 3 times the remedial goal, and PAHs greater than 5 times the remedial goal. This includes removal of four additional polygons in Wildcat Creek with concentrations that are slightly less than three times the remedial goal for PCBs.

2. Incorporate New Maximum Contaminant Level (MCL) for Arsenic

IDEM performed a Five-Year review to determine whether the selected remedy at the site is or will be protective of human health and the environment. As part of the technical review of the remedy, a review of the BHHRA was required primarily to address the following question:

> Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

Chemical concentrations detected in groundwater in the shallow, intermediate and lower zones were compared to available drinking water MCLs and risk-based screening values that were based on EPA Region III Risk Based Concentrations (RBCs) for tap water (concentrations reduced by a factor of 10 for screening). Generally, a chemical was identified as COPC if the maximum detected concentration was greater than its risk-based screening concentration and its drinking water MCL (if an MCL had been established). Since the BHHRA was completed, there have been revisions to the tap water RBCs reflecting additions or changes in the toxicity values for some chemicals, and risk-based screening values have changed accordingly. Since the BHHRA was completed, the MCL for arsenic dropped from 0.05 mg/l to 0.01 mg/l, therefore the lower value should be used for screening.

In shallow groundwater, arsenic was added as a COPC due to the lower MCL. The maximum concentration of arsenic (0.014 mg/l) is slightly above the new MCL, and about 300 times greater than its risk-based screening value (0.0000045 mg/l based on a target cancer risk if $1x10^{-7}$). The associated cancer risk from exposure to this level in drinking water would be about $3x10^{-3}$, exceeding the risk range that is generally regarded as acceptable ($1x10^{-6}$ to $1x10^{-4}$). Although the actual exposure point concentration for arsenic in shallow groundwater would likely be lower than the maximum, this analysis suggests arsenic levels in the shallow groundwater zone could potentially pose an unacceptably high cancer risk. Therefore arsenic could be a contributor to the total risks estimated for use of shallow groundwater.

A remediation goal was not established for arsenic, because arsenic was not originally identified as a COPC in groundwater. Since arsenic has been now identified as a COPC in shallow groundwater and there appear to be potential risks from exposure, a remediation goal should be established for arsenic in groundwater. The exposure assumptions for oral and dermal exposure outlined in the BHHRA can be used to calculate arsenic exposure and associated risks, assuming that the new MCL for arsenic (0.01 mg/l) is adopted as the remediation goal. The estimated cancer risk for arsenic at the MCL is within the acceptable range. The Hazard Index (HI) is above 1 for children, which suggests a slight possibility of adverse non-cancer health effects, but this does not necessarily mean that health effects would occur from exposure to arsenic at the MCL level. There are relatively large uncertainties associated with both the exposure and toxicity components of the risk estimate, therefore these estimates are made using conservative (health-protective) assumptions to avoid underestimating the true risks. The result is likely an overestimate of the true risks. Since the estimated HI for arsenic at the MCL is only two times EPA's benchmark, while the uncertainty may be many times greater, it is difficult to justify a remediation goal for arsenic lower than the MCL.

IDEM and EPA propose that the current MCL for arsenic (0.01 mg/l) be established as a remediation goal for shallow groundwater.

4. Formalize Re-Organization of Project Management Strategy

The ROD documented the selection of final remedial actions for each of the six CSSS OUs. The OUs units are listed below:

OU-1 Site-Wide Groundwater
OU-2 Acid Lagoon Area
OU-3 Wildcat & Kokomo Creeks
OU-4 Markland Avenue Quarry
OU-5 Main Plant Property
OU-6 Slag Processing Area

The remedial response objectives for CSSS are as follows:

I. Prevent ingestion of shallow groundwater that contains contamination in excess of federal and state drinking water standards or criteria, or that poses a threat to human health.

II. Prevent incidental ingestion and direct contact with sludge, soil, and waste piles that contain contamination in excess of federal and state soil standards or criteria, or that pose a threat to human health.

III. Prevent inhalation of airborne contaminants (from disturbed soil) that exceed federal and state air standards or criteria, or that pose a threat to human health.

IV. Prevent the migration of contamination that would result in continued degradation of site-wide groundwater or surface water to levels that exceed federal and state drinking water or water quality standards or criteria, or that poses a threat to human health or the environment, to the extent feasible and practical.

V. Prevent direct contact with contaminated sediment that exceeds federal and state standards or criteria, or that poses a threat to human health.

VI. Prevent incidental ingestion of sediment containing contamination that exceeds federal and state standards or criteria, or that poses a threat to human health.

VII. Prevent ingestion of potentially contaminated fish from the creeks that may present a health risk; a fish advisory has already been posted.

VIII. Prevent sediment impacts to ecological environment.

IX. Restore sediments to levels protective of human health and the environment, to the extent practical and feasible, while minimizing adverse impact to the wetlands from potential remedial activities, and minimizing the potential for sediment to become suspended in the surface water column.

X. Prevent incidental ingestion and direct contact with surface water containing contamination that exceeds federal and state standards or criteria, or that poses a threat to human health.

XI. Prevent surface water impacts to the ecological environment.

XII. Prevent dermal contact with groundwater that contains contamination in excess of federal and state standards or criteria, or that poses a threat to human health.

The major components of the Final Remedial Action that was selected are as follows:

OU-1 Collection of the shallow groundwater by extraction wells installed along the creeks or within the groundwater contamination plumes. Extracted shallow groundwater would be disposed off-site at the Kokomo Wastewater Treatment Plant (WWTP). The intermediate and lower water-bearing zones would be addressed through continued operation of the Martin Marietta Quarry. Construction cost estimate, $13,000.

OU-2 Resource Conservation and Recovery Act (RCRA) impoundment closure; construction of a Corrective Action Management (CAMU) for containment of contaminated material from the RCRA impoundment and surrounding areas (OU2), as well as from OU3, OU4, OU5 and OU6; and construction of a groundwater interceptor trench. Contaminated solids excavation with disposal in the on-site landfill. Aggressive groundwater collection to shorten the time for groundwater to reach cleanup goals or drinking water standards. Deed and groundwater use restrictions. Construction cost estimate, $43,919,000.

OU-3 Removal of the contaminated sediment from two miles of creeks and placement of the material within the on-site CAMU at the Lagoon Area. Construction cost estimate, $12,312,000.

OU-4 Deed and groundwater use restrictions to restrict site access and the use of contaminated groundwater. Installation of a common soil cover to eliminate potential exposure to and direct contact with contaminated solids. Removing contaminated sediment from and backfilling of the quarry pond are also components of this alternative. Construction cost estimate, $10,234,000.

OU-5 Installation of a common soil cover over the contaminated solids, collection of contaminated groundwater and disposal at the WWTP, and the removal of VOC and PCB contaminated soil in two locations along the creeks. Other measures would include groundwater monitoring and deed restrictions. Construction cost estimate, $17,000,000.

OU-6 Two-feet of common fill and topsoil cover across the entire Slag Processing Area with warning barrier (i.e., orange snow fencing) between the slag and the common fill, seeded to minimize erosion. Prior to cap placement, the slag piles will be spread evenly across the relatively flat surface area of the site. Supplementary erosion control (rip-rap and filter fabric) along Wildcat Creek to minimize the potential for slag entering the creek. Deed restrictions to minimize potential exposure to the slag material under the cover. Construction cost estimate, $2,420,000.

EPA and IDEM anticipated that the entire RD/RA would not be funded within any single federal fiscal year. In addition, it was noted that several remedial activities were duplicated across the OUs, and that some efficiencies might be realized if the remedial action tasks were re-organized. EPA, at the request of IDEM, contracted with CH2M Hill to develop a RD/RA Strategy. The final "Technical Assistance Document, RD/RA Implementation Strategy, Continental Steel Superfund Site, Kokomo, Indiana" dated June 22, 2000, organized the Remedial Action components into five (5) contract units that could be implemented separately. IDEM and EPA have agreed to work cooperatively for the RD/RA at CSSS. The work will be divided as follows:

Task	Lead Agency
Remedial Design – inclusive of all contract units	EPA
Contract 1 – Lagoon Solids Excavation and Consolidation	EPA
Contract 2 – Kokomo and Wildcat Creeks Sediment Removal	EPA *
Contract 3 – Markland Avenue Quarry Sediment Excavation	IDEM**
Contract 4 – Backfill and Capping/Covers	IDEM
Contract 5 – Groundwater	IDEM
Community Relations	IDEM

** In order to expedite implementation of this Contract Unit in light of budget constraints, it was determined that this task, which was identified as IDEM-lead in the June 2000 RD/RA Implementation Strategy, would instead be an EPA-lead Contract Unit.*
******** *In order to expedite implementation of this Contract Unit in light of budget constraints, it was determined that this task, which was identified as EPA-lead in the June 2000 RD/RA Implementation Strategy, would instead be an IDEM-lead Contract Unit.*
Note: The Lead Agency determination or the sequence of implementation for any contract unit may change if IDEM and EPA agree that a change would benefit the project implementation.

Work is distributed into the contract units as follows:

- Contract 1. The Lagoon Area sludge and soils would be excavated, treated as necessary, and placed in the CAMU. The double liner base, compensatory floodwater storage area and the leachate management system would be constructed.

- Contract 2. Contaminated sediment throughout the six reaches of the creeks would be removed, managed, solidified (if necessary), and placed within the CAMU. Contract 2 would also include excavation of the PCB-contaminated soils on the Main Plant site along Kokomo Creek and bank stabilization in the slag processing area along Wildcat Creek.

- Contract 3. The sediment in the Markland Avenue Quarry pond would be excavated and dewatered, solidified as necessary, and disposed of in the CAMU. If VOC concentrations exceed levels acceptable for land disposal, a Soil Vapor Extraction (SVE) system that is proposed for this management unit would be used to extract and manage the VOC emissions.

- Contract 4. The VOC hot spot within the Main Plant would be excavated and placed in the CAMU. The proposed covers for the Main Plant would be placed. The Markland Avenue Quarry would be filled and covered. The CAMU would receive a final cover and cap. The Slag Processing area would be leveled and covered. This contract will also include the excavation and disposal of asbestos-containing brick that was left in place under the interim RA of OU5. Off-site disposal may be considered for the asbestos-containing brick.

- Contract 5 - The proposed remedial actions for the sitewide groundwater, the Main Plant groundwater, the Lagoon Area groundwater, and the Markland Avenue Quarry groundwater would be installed.

The reorganized approach decreases the total construction estimate from $75,898,000 to $60,000,000. EPA and IDEM also anticipate that the remedial designs for the five contract units will be completed in sequence as is indicated in the RD/RA Implementation Strategy, and that the entire remedial design will not be completed within any single federal fiscal year.

IDEM and EPA propose to incorporate the June 22, 2000, RD/RA Implementation Strategy into the ROD.

5. Summary of the Comparative Analysis of Proposed Amendments

The National Contingency Plan (NCP), Section 300.430 (f)(I), requires that the alternatives considered for the final remedy be evaluated on the basis of the nine evaluation criteria. When fundamental changes are proposed to a ROD, the lead agency should repeat the ROD process in accordance with the requirements of CERCLA Section 117 by issuing a revised Proposed Plan and an amended ROD. The proposed changes must be evaluated in terms of the nine criteria established in the National Contingency Plan (NCP). The evaluation criteria for this analysis include:

(1) Overall protection of human health and the environment;
(2) Compliance with Applicable or Relevant and Appropriate Requirements;
(3) Long-term effectiveness and permanence;
(4) Reduction of contaminant toxicity, mobility, or volume through treatment;
(5) Short-term effectiveness;
(6) Implementability;
(7) Costs;
(8) Support Agency Acceptance; and
(9) Community Acceptance.

Two of the nine criteria, support agency acceptance and community acceptance, are modifying criteria. The remaining seven criteria are divided into two groups, the threshold criteria and the balancing criteria. The nine criteria are described below.

<u>Threshold Criteria</u>
The threshold criteria relate to statutory requirements that each alternative must satisfy in order to be eligible for selection. These criteria are as follows:

1. <u>Overall Protection of Human Health and the Environment</u> addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. <u>Compliance with ARARs</u> addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of Federal and State environmental statutes and/or provides grounds for invoking a waiver.

<u>Balancing Criteria</u>
The balancing criteria are the technical criteria that are considered during the analysis. These criteria are described as follows:

3. <u>Long-Term Effectiveness and Permanence</u> refer to the amount of risk remaining at a site and the ability of a new remedy to maintain reliable protection of human health and the environment, over time, once cleanup goals have been met. Factors that will be considered, as appropriate, include the following:

- Magnitude of residual risk from untreated waste or treatment residuals remaining at the completion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bio-accumulate.

- Adequacy and reliability of controls, such as containment systems and institutional controls, that are necessary to manage treatment residuals and untreated waste. This factor addresses long-term protection from residuals; the assessment of the potential needs to replace technical components of the alternative such as a cap, extraction wells, or treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

4. Reduction of Toxicity, Mobility, or Volume through Treatment is the degree to which alternatives employ recycling or treatment to reduce the toxicity, mobility, or volume of contamination, including how treatment is used to address the principal threats posed by the site. Factors that will be considered, as appropriate, include the following:

    - The treatment or recycling processes the alternatives employ and the materials they will treat;
    - The amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled;
    - The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling, and specification of which reduction(s) are occurring;
    - The degree to which the treatment is irreversible;
    - The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bio-accumulate of such hazardous substances and their constituents; and
    - The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

5. Short-Term Effectiveness refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

6. Implementability is the technical and administrative ease or difficulty of implementing the cleanup alternatives. The following types of factors are analyzed:

    - Technical feasibility, which includes technical difficulties and unknowns associated with the construction and operation of the technology; the reliability of the technology; the ease with which additional remedial actions may be undertaken; and the degree to which the effectiveness of the remedy can be monitored;
    - Administrative feasibility, including activities needed to coordinate with other offices and agencies; and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions and wetland impacts); and
    - Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and the availability of prospective technologies.

7. Cost addresses the following:

- Capital costs, including both direct and indirect costs;
- Annual operation and maintenance costs (O&M);
- Cost of periodic replacement of system components; and
- Net present value of capital and O&M costs based on the estimated time for the remedial action to achieve cleanup goals.

Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor, and materials necessary to install remedial actions. Indirect costs include expenditures for engineering, financial, and other services that are not part of actual installation activities, but are required to complete the installation of remedial alternatives.

Annual O&M costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. Periodic replacement costs are necessary when the anticipated duration of the remediation exceeds the design life of the system component or components (i.e., groundwater extraction pumps).

A present worth analysis is used to evaluate expenditures that occur over different time periods, by discounting all future costs to a common base year, usually the current year. Though the EPA FS guidance (EPA, 1988) suggests a maximum time frame of 30 years, IDEM has requested that these costs reflect the predicted duration of the remedial alternative, which may exceed 30 years in some cases. EPA has agreed with this approach. A discount rate of 7 percent was used for the present worth analysis. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money, that if invested in the first year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned lifetime.

Modifying Criteria

The following are used to assess support agency and community acceptance to the alternatives.

8. Support Agency Acceptance is the criterion used to consider whether the support agency agrees with the lead agency's analyses and recommendations of the RI/FS and the Proposed Plan.

9. Community Acceptance is the criterion used to evaluate the public comments and will be addressed in the Amendment to the Record of Decision (AROD). The AROD will include a responsiveness summary that presents public comments and the lead agency's responses to those comments. Acceptance of the recommended alternative(s) will be evaluated after the public comment period.

Comparison of Four Proposed ROD Amendments to 1997 With Regard to Nine Criteria

ROD Component	**Overall Protection**	**Compliance with ARARS**	**Long-Term Effectiveness**	**Reduction of Toxicity, Mobility or Volume Through Treatment**	**Short-Term Effectiveness**	**Implementability**	**Cost**	**Support Agency Acceptance**	**Community Acceptance**
1. Incorporate Remedial Action Goals	=	=	=	=	=	+	=	+	*
1.a. No Action	=	=	=	=	=	-	=	-	*
2. Incorporate More Stringent Remedial Action Goal For PCBs in Kokomo and Wildcat Creeks	+	=	+	=	=	=	$10.3M	+	*
2.a. No Action	-	=	-	=	=	=	$12.3M	-	*
3. Incorporate New Maximum Contaminant Level (MCL) for Arsenic	+	+	+	=	=	=	=	+	*
3.a. No Action	-	-	-	=	=	=	=	-	*
4. Formalize Re-Organization of Project Management Strategy	=	=	=	=	=	+	$60M	+	*
4.a. No Action	=	=	=	=	=	-	**$75M**	-	*

\+ Fully meets criteria = Does not affect criteria - Does not fully meet criteria * Criteria will be evaluated after public comment period

Alternative 1 more fully meets the criteria of implementability than Alternative 1.a. by more clearly identifying the remedial goals. Cleanup goals are currently found in two documents. The BHHRA contains proposed cleanup goals that were subsequently amended by the July 1997 Response to NRRBR. The final cleanup goals do not appear in the 1998 ROD.

Alternative 2 more fully meets the goals of overall protectiveness and long-term effectiveness than Alternative 2.a. Alternative 2 incorporates cleanup goals that: (1) do not exceed the current background levels of PCBs in Kokomo and Wildcat Creeks; and (2) could, over time, reduce the levels of PCBs in the affected areas of these creeks such that the Level 5 fish consumption advisory would no longer be necessary. Alternative 2.a. would leave creeks contaminated above the current background levels, and would not effectively decrease the accumulation of PCBs in the fish population. Alternative 2 is also lower in cost that Alternative 2.a., since application of the risk-based approach targets the most highly contaminated sediment areas thereby allowing for partial excavation.

Alternative 3 more fully meets the criteria of overall protectiveness, compliance with ARARs and long-term protectiveness than Alternative 3.a. Alternative 3.a. is not considered as protective or effective in the long-term because it does not prevent ingestion or dermal contact to arsenic in groundwater above MCLs. Alternative 3.a does not comply with current provisions of the Clean Water Act that incorporated the new MCL for arsenic.

The estimated construction cost of Alternative 4 ($60 million) is significantly less than the estimated construction cost of Alternative 4.a. (75 million). The reductions in cost are achieved by grouping similar tasks to eliminate repetitive mobilization costs and achieve reductions in unit costs due to volume.

The EPA is acting as the support agency for the Continental Steel Superfund Site. EPA concurs with Alternatives 1, 2, 3, and 4.

IV. Highlights of Community Participation

The public participation requirements of CERCLA Sections 113 (k)(2)(B)(i-v) and 117 of CERCLA have been met in the remedy selection process. This decision document presents amendments to the selected remedies for the six operable units of the Continental Steel Superfund site, chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the NCP. The decision for this site is based on the Administrative Record.

A Public Meeting was held on (to be inserted),, and public comments were accepted from (to be inserted) until (to be inserted). A Responsiveness Summary in incorporated as Attachment B to this Amendment.

V. Statutory Determination

The selected remedies must satisfy the requirements of Section 121 of CERCLA by protecting human health and the environment and complying with ARARs. CERCLA Section 121 also requires that the selected remedial action be cost effective; utilize permanent solutions and alternative treatment technologies to the extent practicable; and satisfy the preference for treatment as a principal element of the remedy, or provide an explanation as to why the preference is not satisfied.

Based on the information available at this time, IDEM believes the preferred alternatives would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

VI. The Selected Remedies

1. The following remedial goals are presented herein because they were not clearly stated in the 1998 ROD. The remedial goals were developed and proposed in the BHHRA, February 28, 1997. The proposed remedial goals were submitted to the EPA NRRB and the remedial goals for sediment in Kokomo and Wildcat Creeks were subsequently revised in accordance with the NRRB recommendations. These goals are expressed in parts per billion, as micrograms per liter (ug/l) for liquid media and micrograms per kilogram (ug/kg) for solid media.

Remediation Goals for Groundwater (OU1)

Chemical	**Remediation Goals (ug/l)**
Acrylonitrile	2
Arochlor-1242	0.5
Arochlor 1248	0.5
1,1-dichloroethene	7
1,2-dichloroethene	70
Benzene	5
Manganese	50
Chloroform	100
Methylene Chloride	5
Perchloroethene (PCE)	5
Trichloroethene (TCE)	5
Vinyl Chloride	2

Remediation Goals for Acid Lagoon Area (OU2)

Chemical	Remediation Goals (ug/kg)
Benzo(a)anthracene	5,984
Benzo(a)pyrene	598
Benzo(b)flouranthene	5,984
Di-benz(a,h)anthracene	598
Indeno(1,2,3-c,d)pyrene	5,984
Arochlor-1242	1,000
Arochlor 1248	1,000
Beryllium	2,000
Lead	1,096,000

Remediation Goals for Sediment in Kokomo and Wildcat Creeks (OU3)

Chemical	Remediation Goals (ug/kg)
Benzo(a)pyrene	1,585
Benzo(b&k)flouranthene	1,361
Benzo(a)anthracene	1,853
Indeno(1,2,3-c,d)pyrene	930
Arsenic	19,000
Beryllium	840
Arochlor-1016	1,000
Arochlor 1242*	1,000*
Arochlor-1248*	1,000*
Arochlor-1254*	1,000*
Arochlor-1260	1,000

Background level detected for this compound was 4,867. As explained below, the selected cleanup goal was 5,000 ug/l to align with background.

The BHHRA had proposed background or risk based cleanup goals, if higher, for all contaminants except for PCBs. The proposed cleanup goal for PCBs was set at 1 part per million (ppm) due to ecological receptors and the Level V fish consumption advisory already existing for the creeks. However, the State agreed with the recommendation to set the creek sediment cleanup goal for PCBs at the background level of 5 ppm.

Remediation Goals for Markland Quarry (OU4)

Chemical	Remediation Goals (ug/kg)
Benzo(a)anthracene	546
Benzo(a)pyrene	501
Benzo(b&k)flouranthene	779
Di-benz(a,h)anthracene	180
Indeno(1,2,3-c,d)pyrene	404
Arochlor-1248	1,000
Arsenic	19,000
Lead	400,000

Remediation Goals for Soil at Main Plant (OU5)

Chemical	Remediation Goals (ug/kg)
Benzo(a)anthracene	26,703
Benzo(a)pyrene	2,670
Benzo(b&k)flouranthene	26,703
Di-benz(a,h)anthracene	2,670
Indeno(1,2,3-c,d)pyrene	26,703
Arochlor-1242	25,000
Arochlor-1248	25,000
Arochlor-1254	25,000
Arochlor-1260	25,000
Lead	1,096,000

Remediation Goals for Slag Processing Area (OU6)

Chemical	Remediation Goals (ug/kg)
Arsenic	19,000
Lead	400,000

2. IDEM and EPA propose to incorporate a cleanup level for each individual Arochlor of 1ppm based upon the reevaluated background. IDEM and EPA further propose to perform sediment excavation by excavating all polygons with PCBs greater than 3 times the remedial goal, and PAHs greater than 5 times the remedial goal (See Appendix B Figure 3). This includes removal of four additional polygons in Wildcat Creek with concentrations that are slightly less than three times the remedial goal for PCBs.

3. IDEM and EPA propose to incorporate the June 22, 2000, RD/RA Implementation Strategy into the ROD.

4. IDEM and EPA propose that the current MCL for arsenic (0.01 mg/l) be established as a remediation goal for shallow groundwater.

Appendix A - Site Investigation and Risk Assessment Summary

Site Investigation

CSSS properties cover 183 acres. During the Remedial Investigation (RI) the site was divided in to six OUs. The six OUs include:

- OU1 Site-Wide Groundwater;
- OU2 Lagoon Area;
- OU3 Kokomo and Wildcat Creeks;
- OU4 Markland Avenue Quarry;
- OU5 Main Plant; and
- OU6 Slag Processing Area.

The first phase of the RI was conducted in 1993. Details of the studies and activities can be found in the Focused Remedial Investigation/Feasibility Study (RI/FS) Work Plan. Phase II of the RI was conducted in 1995. This phase of the RI addressed the Markland Avenue Quarry, the Main Plant, and the Slag Processing Area. It also generated information to address data gaps for the site-wide groundwater, the Lagoon Area, and Wildcat and Kokomo Creeks. The RI was completed on January 31, 1997 and the FS was completed on February 28, 1997.

Summary of Site Risks

Based on the RI data, human health and ecological risks associated with contaminants detected in groundwater, soils, surface water, and sediments for the site were assessed. A Baseline Human Health Risk Assessment (BHHRA), or baseline screening, was conducted to compare contamination levels at the site with EPA standards. It considered ways in which people and wildlife could be exposed to site-related contaminants and whether such exposure could increase the incidence of cancer and noncarcinogenic (noncancer related) diseases above the levels that normally occur in the study area or population.

Current land use and reasonably anticipated future use of the land at NPL sites are important considerations in determining current risks, potential future risks, and appropriate extent of remediation. Land use assumptions affect the exposure pathways that are evaluated in the BHHRA. The results of the BHHRA aid in determining the degree of remediation necessary to ensure current and long-term protection at the site. The BHHRA considers present use of the site to determine current risks. It may restrict its analysis of future risks to the reasonably anticipated future land use.

The BHHRA uses a conservative estimate when evaluating a potential risk. This provides a high level of protection for public health and the environment. For example, some of the risk estimates assume that the site will be developed for future residential land use and that people use or will regularly use contaminated groundwater for drinking and bathing. Therefore, the excess lifetime cancer risk estimates should be regarded as estimates of potential rather than actual cancer risk.

Potential risks to public health for cancer are expressed in numbers, i.e. $1x10^{-4}$ or $1x10^{-6}$. Cancer risk expressed as $1x10^{-4}$ means that 1 out of 10,000 people exposed to contamination over a 70-year lifetime could develop cancer as a result of the exposure. A carcinogenic risk of $1x10^{-6}$ means that 1 out of 1,000,000 people exposed over a 70-year lifetime could potentially develop cancer as a result of exposure.

The measure for noncarcinogenic risk is termed a hazard index (HI) and is also expressed numerically. When the HI exceeds 1, there is a potential for adverse health effects. The Hazard Quotient (HQ) is the sum of the HIs for a potentially effected community.

10,000 exposures (1 x 10^{-4}). Risks are estimated based on both Central Tendency Exposures (CTE) and Reasonable Maximum Exposure (RME). Central Tendency Exposures represent typical exposures at the CSSS. Reasonable Maximum Exposure represents exposures well above the average, but still within a possible range.

The data from the RI was reviewed to identify COPCs for human health risk evaluation. COPCs were selected based on the number of times detected, maximum concentration, background concentration, potential toxicity, ARARs, and future land use possibilities for the area. COPCs for the CSSS include:
- Metals,
- Semi-volatile Organic Compounds (SVOCs),
- VOCs,
- PCBs, and
- Poly Aromatic Hydrocarbons (PAHs) .

A separate evaluation is performed to evaluate potential risks from lead. Potential risks to public health from lead are evaluated for children by using the Integrated Environmental Uptake BioKenetic (IEUBK) model (EPA 1994), and for adults by using a multi-pathway exposure model developed by EPA (1996). According to the Agency for Toxic Substance and Disease Registry (ATSDR), exposure to lead can affect almost every organ and system in the body. Exposure to lead is much more dangerous in young and unborn children. EPA considered risks from exposures to lead acceptable if the probability that children may have blood lead levels exceeding 10 micrograms per decaliter (µg/dL) is less than 5 percent. Adult exposure evaluations estimate fetal blood lead levels based on exposure to lead in soil by female workers of childbearing age. Ninety-fifth percentile fetal blood lead concentrations should not exceed 10 µg/dL.

Human Health Risk Assessment and COPCs:
The analytical data compiled in RI Phases I and II were reviewed, and COPCs were selected for human health risk evaluation. COPCs were selected for each source area based on frequency of detection, maximum concentration detected, background concentration, potential toxicity, ARARs, and the future use scenario of the source area. The COPCs for each source area, media of concern, and exposure scenario are presented below along with the human health risk assessment evaluations.

The following sections summarize information and the RI/FS and BHHRA results for each operable unit.

OU1 - Site-Wide Groundwater

Remedial Investigation

There are three aquifers under the site, differentiated by their water-bearing capacity. They have been classified as the shallow, intermediate, and lower aquifers or water-bearing zones. These aquifers have been further separated into two categories: (1) those underlying source contaminant areas and (2) those not underlying source contaminant areas. Groundwater appears to have received contaminants from the Main Plant, the Markland Avenue Quarry, the Lagoon Area and/or other areas related to the site, and disposal of hazardous materials. Contaminant plumes were delineated for the shallow, intermediate, and lower water-bearing zones.

Most Kokomo residents rely on public water supplies, although there are private wells in the area. The public water supply for the City of Kokomo is provided by Indiana-American Water Company. Indiana-American Water Company draws its water supply upgradient and greater than five miles from CSSS. Three non-community public water supply wells in the vicinity of CSSS were sampled during the RI and the results were non-detect for the COPCs.

A groundwater model was developed to simulate and predict the interactions between groundwater and surface water, among the three water-bearing zones, and among localized and regional influences from pumping wells. The following conclusions were developed:

- Contaminant transport in the intermediate and lower water-bearing zones is controlled by Martin Marietta Quarry pumping and shallow groundwater discharges to Wildcat and Kokomo Creeks;

- Groundwater flow pathways follow the westerly course of Wildcat and Kokomo Creeks and do not diverge significantly to the north or south; and

- Capture of contaminated groundwater by wells in a residential subdivision southwest of the site is unlikely whether the Martin Marietta Quarry pumping is operational or discontinued.

VOCs were the primary contaminants detected in groundwater. DNAPL (Dense Non Aqueous Phased Liquid), which is produced when various VOCs become commingled, is also present in all three water-bearing zones.

COPCs and Risk Assessment

COPCs were selected for site-wide groundwater based on a residential future land use scenario.

Shallow Water-Bearing Zone

COPCs selected for groundwater in the shallow water-bearing zone include:
- manganese,
- 1,1-dichloroethene,
- 1,2-dichloroethene (cis- and total),
- tetrachloroethene,
- trichloroethene,
- benzene,
- chloroform,
- vinyl chloride,
- Aroclor-1242, and

- Aroclor-1248.

A large portion of the shallow water-bearing zone is contaminated at levels associated with risks above the lower end of the EPA risk range (10^{-6}). In fact, the entire area enclosed by the dashed boundary (see Appendix B, Figure 1a) can be expected to have sufficient groundwater contamination that residential risk may equal or exceed 10^{-5}.

Several areas beneath the site can be expected to have groundwater contamination sufficient to present a cancer risk of greater than 10^{-4}, the upper end of the EPA risk range. These areas include the southern portion of the Lagoon Area, the northern edge of the Lagoon Area, the south central portion of the Main Plant, and a wedge shaped area that extends west from the Markland Avenue Quarry.

Groundwater may pose extreme risks (above 10^{-3}) for future use in a large area beneath the Main Plant and extending west beneath Wildcat Creek and the city's wastewater treatment plant. Two smaller portions of the shallow groundwater plumes also could present extreme threats; a triangular area north of the old Fence Plant, and an area including a small part of the southwest Lagoon Area and extending west under Wildcat Creek. In these areas, major risks are presented by potential exposure to vinyl chloride in groundwater.

<u>Intermediate Water-Bearing Zone</u>
COPCs selected for groundwater in the intermediate water-bearing zone include:

- manganese,
- 1,1-dichloroethene,
- 1,2-dichloroethene (cis- and total),
- acrylonitrile,
- methylene chloride,
- tetrachloroethene (PCE),
- trichloroethene (TCE), and
- vinyl chloride.

Risks associated with contaminated groundwater in the intermediate zone are similar to those found in the shallow zone, but the distribution of risks is significantly different. A large section of the site, extending from the Main Plant to the west, has sufficient contamination to imply potential risk above 10^{-3} (See Appendix B Figure 1b). Risks in this area are mainly associated with potential exposure to vinyl chloride.

Areas with risks still above 10^{-4} exist on the edges of the large highly contaminated zone. These areas include: A triangular zone extending west from the Slag Processing Area; a long narrow strip running from the Main Plant west to the southwest corner of the Lagoon Area; and a strip running from Markland Avenue Quarry, west and north past the former Continental Steel Engineering Building and Wildcat Creek.

<u>Lower Water-Bearing Zone</u>
COPCs selected for groundwater in the lower water-bearing zone include:

- manganese,
- 1,2-dichloroethene (cis- and total),
- acrylonitrile,
- methylene chloride,
- tetrachloroethene,

- trichloroethene, and
- vinyl chloride.

Risks associated with contaminated groundwater in the lower zone are similar to those found in the shallow zone. Extreme risks (above 10^{-3}) are associated with an area to the north of the Main Plant property extending across Wildcat Creek toward the wastewater treatment plant and another area beneath the Slag Processing Area extending east beneath Wildcat Creek (See Appendix B, Figure 1c). Some risks are associated with potential exposure to vinyl chloride. However, risk estimates are dominated by exposure to acrylonitrile. This chemical is found in significant concentrations only in the lower water-bearing zone.

A zone extending from the northeast corner of the Lagoon Area and running mainly eastward toward the old Fence Plant is associated with risks in excess of 10^{-4}. A relatively small area in the northern Lagoon Area is associated with risks in the range of 10^{-5} to 10^{-4}.

OU2 - Acid Lagoon Area

Remedial Investigation
The Acid Lagoon area is approximately 0.3 miles west of the MainPlant. It is bordered on the south and west by Wildcat Creek, on the north by West Markland Avenue, and on the east by the City of Kokomo wastewater treatment plant. The area covers approximately 56 acres and includes five polishing lagoons, two acid (hazardous waste storage) lagoons, and three sludge-drying beds. The lagoons were permitted as Resource Conservation and Recovery Act (RCRA) surface impoundments for treatment of wastewater generated at Continental Steel. This area contains approximately 788,000 cubic yards of soil, sludge, slag, and clay. A fill area near the lagoon entrance is contaminated with VOCs. Some lagoons contain standing water. An abandoned treatment building and wastewater treatment clarifiers are on this site. According to flood maps, the Lagoon Area is within a 100-year floodplain. Immediately to the west of Wildcat Creek lies the Haynes International, Inc. facility and its RCRA closed landfill.

Spent pickle liquor generated at the Main Plant was transferred via a direct pipeline to the two storage lagoons, pumped to a neutralization and treatment system, and neutralized pickle liquor and sludge (generated by the treatment) was deposited in one of five polishing lagoons. The treated liquid was then discharged to Wildcat Creek and the sludge was placed into the three drying beds.

Phase I RI activities included sampling of lagoon surface water and sludge, soils underlying and adjacent to the lagoons, waste piles, sludge in the mixing and clarifier tanks, and water in the basement of the treatment building. Phase II RI activities consisted of groundwater sampling, and a soil gas survey in the entrance area to assess VOCs in the fill.

Elevated levels of arsenic, beryllium, cadmium, lead, manganese, and chromium were detected in the soil and sludge. Iron was identified in the sludge drying beds. Methylene chloride, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) were reported in soil and sludge from the east central and southwest lagoon areas and in the sludge drying beds. Waste piles of slag contained elevated levels of arsenic, beryllium, and chromium. Arsenic, cadmium, copper, lead, manganese, nickel, and zinc were detected in surface water from the acid lagoons. Silver was reported in one sample from the polishing lagoons.

Elevated VOC solids are defined as those solids having a total VOC concentration greater than 1 milligram per kilogram (mg/kg), or one part per million. This concentration was chosen as the cleanup goal for VOCs in contaminated solids because the fate and transport analysis showed that a VOC soil concentration of 1 mg/kg in solid media would leach at MCLs into groundwater. The soil gas survey at the entrance area indicated several integrated plumes of VOCs. Soil and soil gas data identified several areas with elevated VOCs. The primary VOCs identified were cis-1,2-dichloroethene, trichloroethene, and vinyl chloride.

Groundwater underlying the Lagoon Area is impacted primarily by VOCs in the entrance area and to a lesser extent by metals. VOC concentrations are highest in the shallow water-bearing zone at the entrance, in the intermediate water-bearing zone within the Lagoon Area, and in the lower water-bearing zone downgradient. Total VOC concentrations appear to be decreasing in the shallow water-bearing zone, but relatively constant in the intermediate and lower water-bearing zones. The three primary VOCs detected in the soil gas survey were also detected in downgradient wells for all three water-bearing zones. The lower water-bearing zone wells at these locations are the most contaminated, indicating that the plume is migrating vertically downward. Metals present in the Lagoon Area groundwater include iron, manganese, nickel, chromium, and antimony.

DNAPL was noted at the Lagoon Area entrance. The estimated time to attain ARARs is based upon groundwater modeling, which requires that certain assumptions be made to reflect the presence and persistence of DNAPL, effectiveness of the containment, collection, and treatment system, and the variability of the geology. Due to uncertainties, the estimated time for groundwater to reach ARARs is subject to change and may lengthen (up to 30 years).

COPCs and Risk Assessment
There are no ecological receptors on-site and no residential areas border the lagoons. This area is designated for commercial/ industrial use since it contains RCRA surface impoundments. A recreational corridor along the creek has been identified. Recreational use is limited to the creek corridor. Trespassers have been known to frequent this area. Two future use scenarios are considered for the Lagoon Area. One is commercial/ industrial use for the area in general. The second is trespasser use for the creek corridor, the 50 foot wide bank area along Wildcat Creek.

COPCs selected for the Lagoon Area were based on an industrial/commercial and trespasser/recreational future land use scenario.

COPCs selected for on-site surface soil include:
benzo(b) fluoranthene,
benzo(a) anthracene,
benzo(a)pyrene,
dibenzo(a,h)anthracene,
indeno (1,2,3-cd) pyrene,
manganese,
Aroclor-1242,
Aroclor-1248,
beryllium, and
lead.

COPCs selected for the lagoon sludge include:
benzo(a)pyrene,
lead,
manganese, and
beryllium.

COPCs selected for the waste piles include:
Manganese, and
lead.

COPCs selected for the lagoon clarifier tank sludge were:
Manganese, and
beryllium.

In addition, although soil gas results (VOCs) were not used in the RA COPC development (i.e., there are no human health impacts), VOCs are considered COPCs for soil at the entrance area of the Lagoon Area since they may potentially impact groundwater at the CSSS. These COPCs include:
1,1-dichloroethene,
1,2-dichloroethene (cis and trans),

trichloroethene,
vinyl chloride,
tetrachloroethene, and
1,1,1-trichloroethene.

COPCs selected for shallow groundwater include:
1,1-dichloroethene,
1,2-dichloroethene (total),
benzene,
chloroform,
cis-1,2-dichloroethene,
tetrachloroethene,
trichloroethene,
vinyl chloride, and
manganese.

Future onsite commercial/industrial workers and current and future onsite trespassers were evaluated for potential exposures to contaminants from the Lagoon Area. These receptors were evaluated for incidental ingestion of and dermal contact with soil. Trespassers are assumed to be children of ages 6- to 14-years. Worker exposures are quantified for adults. Both the CTE and RME exposure point concentrations are derived from data collected across the entire approximately 56-acre source area.

Cancer Risk Estimates
Carcinogenic risks for the Lagoon area for current and future onsite trespassers and future onsite commercial/industrial workers are discussed below.

Current and Future Onsite Trespassers
Risks based on RME exceed EPA's acceptable (1990) risk range. The total cancer risk estimate for incidental ingestion of soil by current and future trespassers onto the Lagoon Area, based RME, is 5.2E-05. Estimated cancer risk from dermal exposure to contaminants in soil is 1.2E-04 for RME. Aroclors 1242 and 1248 are the main contributors to these risks. Estimated total cancer risk from incidental dermal contact is 1.7E-04 based on RME.

Future Onsite Commercial/Industrial Workers
Risks based on RME are above EPA's 1990 acceptable range. Estimated cancer risk for incidental ingestion of soil by future onsite commercial/industrial workers at the Lagoon Area based on RME is 1.6E-04. Aroclor 1248 is the main contributor to carcinogenic risks for the commercial/industrial worker scenario. Estimated cancer risks from dermal exposure is 3.6E-05 for RME. Aroclor 1248 is again the main contributor to these risks. The total cancer risk estimate from incidental dermal contact is 1.9E-04 based on RME.

The north central part of the Lagoon Area overlies significant levels of COPCs in soil gas. If soil gas in these areas were to migrate inside buildings, cancer risks and noncancer health effects from inhalation of VOCs in indoor air could be unacceptably high. For areas with high levels of soil gas, vinyl chloride (a degradation product of PCE and TCE) is a major contributor to possible risks at the site. Construction should not be considered in these areas because of the potential for volatile chemicals to migrate into indoor air spaces. This applies to residential as well as commercial/industrial development.

Noncarcinogenic Hazard Estimates

Noncarcinogenic health effects estimates for current and future onsite trespassers and future onsite commercial/industrial workers at the Lagoon Area are discussed below.

Current and Future Onsite Trespassers

The HI for incidental ingestion of soil by current and future onsite trespassers at the Lagoon Area is 3.8 for RME. The HI for the exposure pathway exceeds unity, indicating potential health risks may be associated with incidental ingestion of soil by trespassers. The estimated HI from dermal exposure to contaminants in soil for current and future trespassers onto the Lagoon Area is 6.1 for RME. These risks are entirely from exposure to Aroclors 1242 and 1248.

The total noncancer risk estimate from these pathways is 10 based on RME, respectively. The HI based on RME exceeds unity, suggesting that contact with contaminated soil at the Lagoon Area may result in adverse noncancer health effects for current and future onsite trespassers.

Future Onsite Commercial/Industrial Workers

The HI for incidental ingestion of soil by future onsite commercial/industrial workers is 2.9 for RME. The HI for RME exceeds unity, suggesting that there is a potential for adverse health effects from incidental ingestion of soil by future onsite commercial/industrial workers. Noncancer health effects from dermal contact with soil at the Lagoon Area are considered unlikely for future onsite commercial/industrial workers.

The total HI for RME for contact with soil by future onsite commercial/industrial workers of the Lagoon Area exceeds unity, suggesting that adverse effects from contact with soil are possible for these workers.

Risks Associated with Exposure to Lead

Potential exposures to lead in soil at the Lagoon Area are evaluated for current and future onsite trespassers, and future onsite commercial/industrial workers. Trespassers are assumed to be 6- to 7-year-old children.

The IEUBK model predicts that 11.3 percent of children trespassing onto Lead Exposure Area A (see Appendix B, Figure 5) for Lead Exposure Area identification) of the Lagoon Area may have blood lead concentrations of 10 µg/dL or greater. IEUBK modeling results suggest that significant risk from exposure to lead in soil is expected for children who may trespass onto the Lagoon Lead Exposure Area A.

Adult exposures to lead are evaluated using the interim adult exposure methodology developed by U.S. EPA (1996).

The method predicts 95 percentile fetal blood lead levels in women of childbearing age exposed to lead in soil of 13.73 µg/dL for exposure Area A of the Lagoon (see Appendix B, 5). Predicted blood lead concentrations exceed the acceptable concentration for Area A.

Ecological Assessment

Risks to ecological receptors in the Lagoon Area are principally from chemical stressors; however, the ecology in this source area also shows signs of physical stress from the presence of slag materials in soil and sediment. Significant impacts occur among vegetation and the quality of potential terrestrial, semiaquatic and aquatic habitat in this source area is diminished as a result. The major contributors of risk from chemical stressors for sediment and sludge are:

- acenaphthene,

- ethylbenzene,
- manganese,
- copper,
- lead,
- mercury,
- nickel, and
- barium.

Chromium and copper are major contributors of risk in surface soil in the Lagoon Area waste piles. Lead and zinc are major contributors of risk in surface water. Copper, lead, and mercury in sediment (sludge) are major contributors of risk to aquatic receptors and great blue heron.

OU3 - Kokomo and Wildcat Creeks

Remedial Investigation

The Wildcat and Kokomo creeks are generally 50 to 100 feet wide, up to four feet deep and extend some 20,000 feet within the CSSS. These two creeks run along the borders of the Main Plant, the Lagoon Area, and the Slag Processing Area, and have been impacted by direct discharge of material, runoff from the source areas, and upstream industrial sources. They are designated for recreational use. A recreational corridor extends along most of the banks. The creeks have received water from the plant's wastewater recycling, treatment and filtration system, neutralized pickle liquor from the Lagoon Area, discharge from site outfalls and storm water runoff from the site in general.

Wastewater from Continental Steel was discharged through five outfalls, designated CS-01 through CS-05 (ISPCB, 1985). CS-01, which has not been located, was the main processing outfall before the installation of the filter plant. Upon installation of the plant, this outfall was eliminated. Discharge at CS-02 included non-contact cooling water, some process water, stormwater; and cooling tower water. In 1984, a lift station was installed which pumped the wastewater from this line to the filter plant. CS-02 then discharged to Kokomo Creek only when excessive stormwater caused an overflow. CS-03 was an emergency overflow for untreated wastewater. CS-04 discharged wastewater from the Lagoon Area. CS-05 served as both an outfall and a water intake. As an outfall, CS-05 was the discharge point for filtered, non-contact cooling waters and process waters from rolling, drawing, and annealing operations. As an intake, water was withdrawn daily from Wildcat Creek.

Surface water and sediment sampling was performed as part of the RI. The creeks were subdivided into six sections or reaches, with surface water and sediment samples collected from all six. Reaches 1, 2, 3, 5 and 6 correspond to Wildcat Creek and Reach 4 corresponds to Kokomo Creek. Background samples were collected upstream within both creeks(See Appendix B Figure 2). Shallow groundwater sampling was conducted at monitoring wells adjacent to the creeks. Groundwater results were compared to sediment and stream water results to evaluate whether an interrelationship exists between the creeks and groundwater.

Groundwater sampling results showed elevated levels of VOCs, including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride. Elevated levels of nickel and lead were also detected in shallow groundwater adjacent to the creeks. Groundwater contamination indicates that the source areas (e.g., lagoons, landfills, and spills) are more significant contributors to groundwater contamination than are the creeks.

Fish tissue analyses performed by the Indiana Department of Environmental Management have identified several contaminants, including PCBs, mercury, and the pesticides, at elevated levels prompting a Level Five fish consumption advisory for the Wildcat Creek in the vicinity of the Continental Steel Superfund Site.

COPCs and Risk Assessment

COPCs selected for sediment in the Wildcat and Kokomo Creeks include:

- benzo(a)anthracene,
- benzo(b) fluoranthene,
- benzo(g,h,i)perylene,
- indeno(1,2,3-c,d)pyrene,
- benzo(a)pyrene,

- dibenzo(a,h)anthracene,
- arsenic,
- beryllium,
- Aroclor-1016,
- Aroclor-1242,
- Aroclor-1248,
- Aroclor-1254, and
- Aroclor-1260.

The potential risk to recreational visitors to Kokomo and Wildcat creeks was evaluated for incidental ingestion of and dermal contact with sediment. Exposure to noncarcinogens is evaluated for young children and exposure to carcinogens for adults. Both CTE and RME exposure point concentrations are derived from data collected in each of six reaches of the creeks.

Carcinogenic Risk Estimates

Cancer risk estimates for these pathways are summarized below.

Sediment Ingestion and Dermal Contact with Sediment, Carcinogenic Risk - Recreational Visitor

Reach	Risk Assessment Determination
Reach 1	Estimated cancer risks from incidental ingestion of sediment by recreational visitors in Reach 1 are within and above EPA's acceptable range. Aroclors 1254 and 1260 are the main contributors to these risks.
Reach 2	For Reach 2, estimated cancer risks are within and above EPA's acceptable range. The greatest contribution to these risks is from Aroclor 1248.
Reach 3	Cancer risks for Reach 3 are within EPA's (1990) acceptable range.
Reach 4	Estimated cancer risks based on average exposure are within EPA's (1990) acceptable range but risks based on RME exceed it. Aroclors 1016, 1248, and 1254 are the main contributors to these risks.
Reach 5	Estimated cancer risks based on average exposure are within EPA's (1990) acceptable range, but risks based on RME exceed it. For Reach 5, Aroclor 1016 and 1254 are the greatest contributors to overall risk.
Reach 6	Cancer risks are within EPA's (1990) acceptable range.

Noncarcinogenic Hazard Estimates

Non-carcinogenic risks to recreational visitors to Kokomo and Wildcat creeks were evaluated for incidental ingestion of sediment. Results are described below.

Sediment Ingestion, Non-Carcinogenic Risk - Recreational Visitor

Reach	Risk Assessment Determination
Reach 1	The Hazard Index (HI) based on RME exceeds unity (one), suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 1.
Reach 2	The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 2.
Reach 3	The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 3.
Reach 4	The HI based on RME exceeds unity, suggesting that there is a potential for adverse

	health effects from exposure to sediment in Reach 4.
Reach 5	The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 5.
Reach 6	HIs for Reach 6 do not exceed unity, indicating that Noncancer health effects from exposure to sediment are unlikely.

Risk Associated with Exposure to Lead

The potential risks to recreational visitors were evaluated for potential exposures to lead in sediment in Kokomo and Wildcat creeks. Exposure to lead is evaluated for young children. Three- to 6-year-old children are considered most likely to play with creek sediment, therefore this age group is evaluated for potential exposures to lead. IEUBK modeling predicts that the probability of children (exposed to lead in sediments in Reaches 1 through 6 of the Creeks) and having blood lead levels exceeding 10 µg/dL is 0.41, 2.39, 0.55, 0.37, 2.87, and 0.73 percent for children, respectively. U.S. EPA (1994b) recommends that the probability of young children's blood lead levels in excess of 10 µg/dL does not exceed 5 percent. Based on this evaluation, exposure to lead in sediments at Kokomo and Wildcat creeks is not likely to result in unacceptably high blood lead levels in children.

Surface Water Ingestion - Recreational Visitor

For surface water in Kokomo and Wildcat creeks, the following noncarcinogenic COPCs were selected:

- TCE,
- arsenic,
- barium,
- manganese,
- nickel, and
- zinc.

Average estimated HQs for these chemicals are less than one, suggesting that adverse noncarcinogenic risks from exposure to surface water are not likely.

Ecological Assessment

PCBs in creek sediment are the major contributors of risk to aquatic receptors, mink, and Indiana bat. Zinc and cadmium also pose significant risk to aquatic receptors exposed to sediment; however PCB contamination of creek sediment causes the greatest risk to these receptors and Indiana bat, which is an endangered species. Lead and zinc in stream water in the creeks are contributors of risk to aquatic receptors, mink, and Indiana bat.

OU4 - Markland Quarry

Remedial Investigation

This 23-acre area was formerly a limestone quarry, covering nearly the entire area. It is bordered by Harrison Street to the north, West Markland Avenue to the south, Courtland Avenue to the east, and Brandon Street to the west. The quarry was sold to Continental Steel Corporation (CSC) in 1947. CSC backfilled about 3/4 of the quarry with waste material such as drums, slag, refractory brick, pig iron, baghouse wastes, and tanks of oil and solvents. More than 1.2 million cubic yards of material from the CSC were deposited in the quarry. The quarry varied in depth from 70-90 feet and includes a pond (4 acres).

This area was also used as drum disposal/staging area. According to former employees, the quarry served as a drum reclamation area where drums were dumped directly onto the ground and disposed of in the quarry pond. The quarry is in a residential area, is an attractive nuisance, and has no ecological significance. The quarry area is zoned for residential use.

Previous EPA investigations (July 1986, May 1988) revealed approximately 400 (mostly empty) drums, an abandoned storage tank, and slag, ash and refractory brick piles in the area. Sediment in the pond contains high concentrations of VOCs and DNAPL (Dense Non-Aqueous Phased Liquid). The sediments are four to seven feet thick and are located below 50 feet of water. Samples of the contents of some drums revealed elevated levels of benzene, toluene, tetrachloroethane, and benzoic acid. Soil samples taken from around the drum storage area contained elevated levels of phenol, di-n-octylphthalate, TCE, and PCB-Aroclor l248.

Sampling of the quarry pond in l987 revealed that the liquid in the pond had a pH of approximately 11.5 for the top samples, and l2.6 for the bottom samples. Low concentrations of copper, zinc, and mercury were present in some samples. DCE and TCE were uniformly present, with higher concentrations of TCE detected in the bottom samples. Very low concentrations of other volatile and semi-volatile organics were detected in the bottom samples. Sediment sampling revealed high concentrations of TCE (>200,000 μg/Kg).

Phase I Remedial Investigation (RI) in the Markland Avenue Quarry included sampling of the pond water and the shallow subsurface soil/fill. Phase II activities performed in the quarry included surface soil sampling (on-site and off-site residential), a soil gas survey, groundwater screening**,** groundwater sampling, and quarry pond surface water and sediment sampling.

The soil gas survey detected four areas of elevated VOC (greater than 1 mg/kg), consisting primarily of trichloroethene (TCE) and its degradation products. The vertical extent could not be defined, because soil gas measurements were limited to 20 feet in depth, and fill extends from 50 to 70 feet in depth. The highest contaminant concentration is located just north of the abandoned concrete structure in the southwest portion of the site. This area is of concern because of the relatively high concentration of vinyl chloride. The other two areas and an area of lesser concentration are located along a line parallel to an old rail line that crossed the quarry. Surface drum releases and drum burial that reportedly occurred on the Quarry property and may be the sources of the elevated VOC solids.

Surface soils were collected from the fill area (on-site) and at selected residential properties surrounding the quarry to evaluate the potential risks associated with these soils. Elevated levels of PAHs, PCBs, lead, arsenic, and zinc were detected in the fill area soils. PAH and PCB contamination appear primarily in the southern half of the fill area. Lead and arsenic contamination are widespread and zinc contamination is sporadic. Residential soil samples downwind from the quarry show no metals (including lead) detected at levels exceeding IDEM or EPA Action Levels.

The quarry pond sediment is contaminated with VOCs, PAHs, PCBs and metals. DNAPL (mostly from TCE) is present within the sediments and is likely migrating into the less fractured bedrock of the intermediate water-bearing zone. Most of the contaminants exceed sediment benchmark screening levels as defined within the BHHRA. The sediments are a continuing source of contamination to surface water and groundwater. The contaminants of concern are the VOCs, because they are highly mobile. Trichloroethene is the most prevalent and was detected at the highest concentrations. Most of the contaminants detected in the sediment exceed benchmark screening levels, which are based on aquatic toxicity.

The quarry pond surface water is contaminated with VOCs, primarily, TCE. It is likely that VOC contaminants are migrating from the fill material, DNAPL in the sediments, and groundwater. Three metals were detected. Pond water exhibited a pH of 11.5 near the surface and a pH of 12.7 at depth. The high pH indicates there may be a contaminant of a very basic nature in the quarry fill that has not yet been identified. The high pH may affect the degradation of organic constituents in the groundwater.

The primary contaminants in the groundwater are TCE, cis-1,2-dichloroethene, and vinyl chloride. They are highest under the fill area in the shallow water-bearing zone and downgradient of the quarry pond in the intermediate water-bearing zone. The lower water-bearing zone shows the least groundwater impacts. VOC concentrations appear to decrease in the shallow water-bearing zone and increase in the intermediate zone. VOCs appear to have migrated to the west side of the site in the intermediate and lower water-bearing zones. The presence of the TCE breakdown compounds (cis-1,2-dichloroethene and vinyl chloride in groundwater results indicate that degradation of components in the intermediate zone is well progressed.

The DNAPL in the quarry pond may also migrate vertically and laterally in directions that do not coincide with groundwater flow. Migration from the sediments would likely be into the intermediate water-bearing zone based on the elevation of the quarry sediments. DNAPL may also migrate downward entering the bedrock fractures located below the sediment and on the west and north sides of the quarry pond. Re-suspension of the sediments by disturbing their current state of rest may mobilize DNAPL into the shallow water-bearing zone. DNAPL that originates within the fill likely migrates down to the lower portions of the quarry. DNAPL is likely present in fractures in the lower water-bearing zone as well, having migrated through vertical fractures in the bedrock.

COPCs and Risk Assessment

COPCs selected for the Markland Avenue Quarry were based on a residential future land use scenario. The only COPC selected for surface water is zinc. COPCs selected for on-site surface soil include:

- benzo(a)pyrene,
- benzo(a)anthracene,
- benzo(b&k)fluoranthene,
- dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene,
- Aroclor-1248,
- arsenic, and
- lead.

In addition, although soil gas results (VOCs) were not used in the BHHRA COPC development (i.e., there are no human health impacts), VOCs are considered COPCs for the Markland Avenue Quarry since they may potentially impact groundwater at the CSSS. These COPCs include:

- 1,1-dichloroethene,
- 1,2-dichloroethene (cis and trans),
- trichloroethene, and
- vinyl chloride.

COPCs selected for shallow groundwater include:

- 1,1-dichloroethene,
- 1,2-dichloroethene (total),
- benzene,
- chloroform,
- cis-1,2-dichloroethene,
- tetrachloroethene,
- trichloroethene,
- vinyl chloride, and
- manganese.

Five groups of receptors were evaluated for potential exposures at Markland Avenue Quarry: current and future offsite residents, future onsite residents, current and future onsite commercial/industrial workers, future onsite construction workers, and current and future onsite trespassers. All receptors are evaluated for incidental ingestion of and dermal contact with soil. Trespassers are also evaluated for ingestion of surface water and dermal contact with surface water in the quarry. Residential exposures are quantified for 1- to 6-year-old children and adults, and trespassers exposures are quantified for 6- to 14-year-old children. Worker exposures are quantified for adults.

As mentioned above, high concentrations of COPCs have been detected in soil gas due to buried wastes and drums. Contaminants in soil gas could theoretically migrate into any buildings constructed in the future and be inhaled by people living or working in the buildings. Inhalation of indoor air is evaluated on a site wide basis for residents. The evaluation shows that exposure to contaminants in indoor air may be associated with significant risk for future onsite residents at the quarry. These results can also be applied to the commercial/industrial worker scenario. Even though it would be assumed there would be reduced exposure frequency and duration for commercial/ industrial workers versus residents, risk estimates may still be unacceptably high.

<u>Carcinogenic Risk Estimates</u>

Future Onsite Construction Workers

Future onsite construction workers at the Quarry are evaluated for incidental ingestion of soil and dermal contact with soil. The estimated cancer risk from incidental ingestion of soil by future onsite construction workers is 1.4E-06 for RME. Arsenic is the main contributor to these risks. Estimated cancer risks for future onsite construction workers from dermal exposure to contaminants in soil are below EPA's acceptable risk range.

Current and Future Onsite Trespassers

Incremental cancer risk estimates for people who may trespass onto the Quarry currently or in the future are evaluated for incidental ingestion of soil, dermal contact with soil, incidental ingestion of surface water, and dermal exposure to contaminants in surface water. These risks are within EPA's (1990) acceptable risk range. The estimated risks for contact with sediment and surface water were at the bottom of EPA's acceptable risk range. Exposure to surface water is not expected given the poor water quality (pH of 12 or greater). Estimated risks from exposure to surface water are therefore not added to other risk estimates in the calculation of total cancer risk for trespassers.

Noncancer Risk Estimates

Noncarcinogenic health effect estimates from exposure to contaminants at the Quarry were estimated for current and future offsite residents, future onsite residents, future onsite commercial/ industrial workers, construction workers, and current and future onsite trespassers.

Current and Future Offsite Residents

Current and future offsite residents near the Quarry were evaluated for incidental ingestion of and dermal contact with soil when working and playing in their yards. The total HI based on RME is greater than 1, suggesting a potential for adverse health effects for this exposure scenario. Dibenz(a,h)anthracene is the only non-metal COPC selected for offsite residential soil. Noncarcinogenic toxicity criteria are not available for this chemical. Health effects from dermal contact with soil by future offsite residents near the Quarry were therefore not estimated. Total HIs for the dermal exposure pathway are identical to those from incidental ingestion of soil. The HI from RME (2.8) exceeds unity, indicating a potential for adverse noncancer health effects from exposure to soil by current and future offsite residents near the Quarry.

Future Onsite Residents

Noncarcinogenic health effects estimates for ingestion of soil by future onsite residents on the Quarry based on CTE and RME are 1.5 and 6.4, respectively, suggesting a potential for adverse health effects from ingestion of soil for future onsite residents. The RME HQ for arsenic (3.6) exceeds one, which indicates that there is a potential for adverse noncancer health effects. Estimated HIs for dermal contact with soil by future onsite residents at the Quarry are less than unity, therefore adverse health effects from dermal contact with soil are not likely for future onsite residents. Estimated total HIs from these pathways indicate that there is a potential for adverse noncancer health effects for future onsite residents who may contact soil at the Quarry.

Soil gas data for the Markland Avenue Quarry indicate that there are significant releases of VOCs in some areas of the Quarry. The evaluation suggests that inhalation of VOCs released to indoor air could result in adverse noncancer health effects, if development was to occur at the Quarry.

Current and Future Onsite Commercial/Industrial Workers

Current and future commercial/industrial workers at the Quarry are evaluated for incidental ingestion of soil, dermal contact with soil, and inhalation of VOCs released from buried wastes and drums into indoor air. Potential exposure pathways are thought to be incomplete for current commercial/industrial workers at the Markland Avenue Quarry, risk estimates are, however, developed for future workers at the Quarry.

Estimated HIs for incidental ingestion of soil by future onsite commercial/industrial workers at the Quarry are less than unity, suggesting that adverse noncancer health effects from exposure to soil are not likely for future onsite commercial/industrial workers at the Markland Avenue Quarry.

Releases of vapors from buried wastes and drums into indoor air is a potentially complete exposure pathway for future onsite commercial/industrial workers. This pathway may result in adverse health effects for commercial/industrial workers, if development took place in areas of the quarry where releases are occurring.

Future Onsite Construction Workers

Future onsite construction workers at the Quarry are evaluated for incidental ingestion of soil and dermal contact with soil. The HIs are less than unity, suggesting that adverse health effects from contact with soil are unlikely for future onsite construction workers at the Markland Avenue Quarry.

Current and Future Onsite Trespassers

Current and future trespassers at the Markland Avenue Quarry are evaluated for incidental ingestion of soil and surface water, and dermal contact with soil and surface water. Noncancer health effects estimates for incidental ingestion of soil by current and future onsite trespassers are less than unity suggesting that adverse health effects from ingestion of soil and dermal contact with soil are not likely to occur for the current and future trespasser.

Exposure to surface water is not likely given the very poor water quality (pH of 12 or greater). The calculated HI for RME for ingestion of quarry water is 0.1. The total HI for RME for dermal contact with quarry water is approximately 0.5. This suggests no significant risk for ingestion or dermal contact of surface water while swimming in the Quarry.

Risks Associated with Exposure to Lead

Potential exposures to lead in soil at the Markland Avenue Quarry are evaluated for current and future onsite trespassers, future onsite residents, and future onsite commercial/industrial workers. Lead is not considered a COPC for offsite residential soils. Future onsite residential exposures are quantified for infants to 6-year-old children, and worker exposures are quantified for adults. Since the IEUBK model evaluates potential exposures to lead for young children, trespassers are assumed to be 6 to 7 years old. The cumulative results demonstrated that there is a 0.21 percent probability that the blood lead concentrations for children residing at the Quarry may be 10 µg/dL or greater. These results suggest significant risk from exposure to lead in soil is not expected for children who may reside at the Markland Avenue Quarry.

Ecological Assessment

Risks to ecological receptors in Markland Avenue Quarry are principally from chemical stressors. However, the aquatic ecology of sediment and surface water is expected to be impacted by the high alkalinity (pH 12) of the waterbody. The major contributors of risk for surface soil in Markland Avenue Quarry are copper, chromium, and zinc. These COPCs in surface soil have low contributions from background and represent high risk to American Robin. Risks to robin were high to moderate for lead and nickel, while the background contribution was significant for these COPCs. Cadmium, barium, and arsenic also show significant risk to robin, but background contributions to these risks are significant. Semi-quantitative risk estimates to wildlife receptors using surface soil to benchmark comparisons showed moderate risks from zinc, PAHs, copper and chromium; however, only copper and chromium had low contributions from background.

OU5 - Main Plant

Remedial Investigation
The Superfund designated area of the Main Plant consists of 94 acres bordered by West Markland Avenue to the north, Defenbaugh Road and private property to the south, Leeds Street to the east and Wildcat Creek to the west. The Main Plant contained most of the steel operations. Industrial operations affected surface soil. There is contaminated soil west of the plant along Wildcat Creek. The south Kokomo city sewer main lines transgress through the CSSS Main Plant property under the original Park Avenue location.

Phase I RI activities included collection of samples from inside and outside the buildings. Field investigations and previous work by EPA included sampling of process sewers and soil from stained areas. Phase II RI activities (excluding the buildings) included surface and subsurface soil sampling, groundwater sampling, process sewer sampling**,** basement water sampling, soil gas sampling, adjacent residential surface soil sampling, and high volume air sampling.

Numerous surface spills have resulted in an impact to soils from VOCs, SVOCs and PAHs, PCBs, pesticides, and metals. The most significant releases are those involving VOCs west of Building 112 (Nail Mill). Other significant surface spills include one in the vicinity of Kokomo Creek where VOCs, PAHs, and lead were detected, and the surface spill at the southeast corner of Building 71B (Wire Galvanizing) where PCBs, pesticides, lead, and zinc were detected. The area east of Buildings 5 and 42 was observed to have oil saturated soils along with concentrations of PAHs, PCBs, and lead.

Groundwater impact in these areas is likely related to operational practices and spilled chemicals, mostly VOCs. The primary contaminants in groundwater are trichloroethene (TCE), cis-1,2-dichloroethene, and vinyl chloride. VOCs were highest in the intermediate water-bearing zone near Wildcat Creek. VOC concentrations appear to be decreasing in all three water-bearing zones, except at Wildcat Creek. TCE concentrations appear to be decreasing, while cis-1,2-dichloroethene and vinyl chloride are increasing. VOC concentrations at Wildcat Creek indicate a plume migrating downgradient from the Main Plant. The presence of chlorinated VOCs indicates that migration of contaminants in the shallow water-bearing zone can occur under creek beds.

The vertical extent of groundwater contamination in the Main Plant area is not well defined. The assumed distribution of DNAPL includes residual DNAPL in shallow soils at spill locations and in fractures in the shallow, intermediate and lower water-bearing zones. The DNAPL migration will follow structural features such as the fractures in the bedrock.

COPCs and Risk Assessment
COPCs selected for the Main Plaint were based on an industrial/commercial future land use scenario. COPCs selected for on-site surface and subsurface soil include:

- benzo(a)anthracene,
- benzo(a)pyrene,
- benzo(b&k)fluoranthene,
- dibenzo(a,h)anthracene,
- indeno(1,2,3-cd)pyrene,
- Aroclor-1242,
- Aroclor-1248,
- Aroclor-1254,

- Aroclor-1260, and
- lead.

In addition, VOCs are considered COPCs for the Main Plaint since they may potentially impact groundwater at the CSSS. These COPCs include 1,2-dichloroethene and trichloroethene. COPCs selected for shallow groundwater include:

- 1,1-dichloroethene,
- 1,2-dichloroethene (total),
- benzene,
- chloroform,
- cis-1,2-dichloroethene,
- tetrachloroethene,
- trichloroethene,
- vinyl chloride,
- Aroclor-1242,
- Aroclor-1248, and
- manganese.

Four different receptor groups are evaluated for the Main Plant area: current offsite residents; future onsite commercial/industrial workers; future onsite construction workers; and current and future onsite trespassers. Residential exposures are quantified for 1- to 6-year-old children and adults, and exposures for trespassers are quantified for 6- to 14-year-old children. Worker exposures are quantified for adults. Both the CTE and RME exposure point concentrations are derived from data collected across the entire approximately 183 acre source area. Cancer and noncancer risk/hazard estimates are based on these values.

Cancer Risk Estimates
Risks are estimated based on both CTE and RME.

Current Offsite Residents
Current offsite residents near the Main Plant were evaluated for incidental ingestion of soil and dermal contact with soil when working or playing in their yards. Contaminated soil was removed from affected residential yards through a non-time critical removal action that was completed in 1998.

Future Onsite Commercial/Industrial Workers
Future commercial/industrial workers at the Main Plant are evaluated for incidental ingestion of soil, dermal contact with soil, and inhalation of volatile organics released to indoor air.

Total carcinogenic risks for incidental soil ingestion are 1.1E-06 and 7.4E-05 for average exposure and RME, respectively. Aroclor 1248 and Aroclor 1254 are the main contributors to carcinogenic risks for this exposure pathway.

Total risks for commercial/ industrial workers from exposure to contaminated soil are at the bottom and at the top of EPA's acceptable range. Benzo(a)pyrene, dibenz(a,h)anthracene and the PCBs contribute approximately equally to these risks.

Based on soil gas sampling, significant release of VOCs into indoor air at the Main Plant is not expected. Risks from inhalation of indoor air should be negligible for commercial/industrial workers at the Main Plant.

Future Onsite Construction Workers
Total risks associated with exposure to soil are below and at the bottom of EPA's (1990) acceptable range.

Current and Future Onsite Trespassers
Current and future onsite trespassers at the Main Plant are evaluated for potential exposures from incidental ingestion of soil and dermal contact with soil. Total average and RME carcinogenic risks for the trespasser scenario are within the 10^{-6} to 10^{-4} range considered acceptable by the EPA (1990). Aroclor 1242 and 1254 are the main contributors to risks from RME.

Noncarcinogenic Hazard Estimates
Noncarcinogenic health effects estimates for current offsite residents, future onsite commercial/ industrial workers, future onsite construction workers, and current and future onsite trespassers scenarios are discussed below.

Current Offsite Residents
Noncancer health effects estimates for incidental ingestion of soil by offsite residents range from 5.6E-03 for zinc to 8.5E-01 for arsenic for average exposure and from 9.5E-02 to 2.40 for the same chemicals for RME. Total HIs for average and RME estimates for the soil ingestion pathway are 0.9 and 2.7, respectively. Since dermal exposures are not evaluated, these estimates are identical to those from ingestion of soil. Since HIs based on RME exceed unity, there is a potential for adverse health effects associated with exposure to soil by current offsite residents.

Future Onsite Commercial/Industrial Workers
The noncarcinogenic hazard estimate for incidental ingestion of soil by future onsite commercial/ industrial workers is 1.1 for RME. The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to soil by commercial/industrial workers at the Main Plant. The estimates are entirely due to exposure to PCBs.

Future Onsite Construction Workers
Estimates of total noncarcinogenic health effects for the future onsite construction workers scenario are 0.009 and 1.6 for average exposure and RME, respectively. Aroclor 1242, 1248, 1254, and 1260 contribute almost entirely to these HIs. Estimated HIs for dermal contact with soil are 0.004 and 0.1 for average exposure and RME, respectively. Total HIs for future onsite construction workers at the Main Plant from incidental ingestion of soil and dermal contact based on RME exceeds unity for this exposure scenario, suggesting that some measure to protect construction workers who may intensively contact soil at the Main Plant may be justified.

Current and Future Onsite Trespassers
Estimates of noncancer health effects from incidental ingestion of soil by current and future trespassers onto the Main Plant are 0.04 and 1.1 for average exposure and RME, respectively. More than 99 percent of these HI estimates are from the polychlorinated biphenyls (Aroclor 1242, 1248, 1254, and 1260). Estimated HIs for dermal contact with soil are 0.02 and 2.4 for average exposure and RME, respectively. Most of the HI estimate is due to Aroclors 1242 and 1248. The estimated total HI exceeds unity, therefore the potential exists that exposure to soil by trespassers may result in adverse health effects.

Risks Associated with Exposures to Lead
Potential exposures to lead in soil at the Main Plant are evaluated for onsite trespassers and commercial/industrial workers. Since the IEUBK model was developed to evaluate exposures to lead in young children, trespassers are assumed to be 6 to 7 years old. Offsite residential lead in soil was addressed by the non-time critical removal action completed in 1998.

The IEUBK model predicts that more than 5 percent of children trespassing onto Lead Exposure Areas B, E, and F of the Main Plant may have blood lead concentrations of 10 µg/dL or greater . EPA (1994) considers risks from exposures to lead unacceptable if the probability that children may have blood lead levels exceeding 10 µg/dL is greater than 5 percent.

Adult exposures to lead are evaluated using the interim adult exposure methodology developed by U.S. EPA (1996). The method predicts 95th percentile fetal blood lead levels of 13.07, 98.07, and 11.31µg/dL for female workers of childbearing age exposed to lead in soil in exposure Areas B, E, and F, respectively (See Appendix B Figure 6). Ninety-fifth percentile fetal blood lead concentrations should not exceed 10 µg/dL (EPA 1996).

Ecological Assessment
Ecological risks in the Main Plant source area are due to chemical stressors identified in surface soil, but slag materials in soil also produce significant physical stress on the vegetation. Major contributors of risk for surface soil in the Main Plant are copper and PCBs (mostly Aroclor 1242). Other contributors include zinc, lead, PAHs, cadmium, copper, and chromium

OU6 - Slag Processing Area

Remedial Investigation
The Slag Processing Area contains approximately 208,000 cubic yards of slag, much of it in stockpiles. The site includes an open, graded (relatively flat) area with seven piles of slag, the largest pile having a maximum height of about 45 feet. The piles include a total volume of about 62,000 cubic yards. Historical information indicates that the southwestern quarter of the area was formerly a quarry (Chaffin Quarry), was approximately 30 feet deep, and is now filled with slag. The area is located between Wildcat Creek and Markland Avenue. It is visible to the public and is easily accessed. The Wildcat Creek bank to the west has been subjected to runoff and erosion. The surrounding area is generally residential.

Slag primarily consists of calcium and iron oxides with smaller amounts of aluminum, chromium, lead, manganese, magnesium, and zinc oxides. The observation of drums and the confirmation of drum disposal at other CSSS properties indicates that drum burial was a standard practice. The drums observed in this area were in varying states of decay. The majority may have been empty or near empty at the time of disposal.

Several VOCs were detected in the intermediate and lower water-bearing zones**.** This vertical distribution indicates VOCs likely originate from upgradient sources. Groundwater beneath the Slag Processing Area will not be addressed through source control alternatives. The groundwater beneath the Slag Processing Area will be addressed in the management of migration for site-wide groundwater , Operable Unit 1.

COPCs and Risk Assessment
COPCs were selected for the Slag Processing Area based on a residential future land use scenario. COPCs selected for on-site surface soil in the Slag Processing Area include lead and arsenic.

The slag does not leach constituents at concentrations above ARARs. Therefore, the only health issue is direct contact exposure for metals. Based on the Risk Assessment, under a residential future use scenario the slag and the surficial solids across the majority of the Slag Processing Area pose a direct contact risk to human health due to the presence of lead and arsenic. A residential scenario was utilized for baseline cleanup goals. The RI noted a potential pathway for contamination of Wildcat Creek through uncontrolled surface water. Metals identified in the slag stockpiles and surficial solid media are also contaminants of concern for Wildcat Creek sediment and surface water.

Potential exposures to contaminants associated with the Slag Processing Area are evaluated for: future onsite residents, future onsite commercial/industrial workers, future onsite construction workers, and current and future onsite trespassers. All are quantitatively evaluated for incidental ingestion of soil. Residential exposures are quantified for 1- to 6-year-old children and adults; trespassers are assumed to be 6- to 14-year-old children. Worker exposures are quantified for adults. Cancer and noncancer risk/hazard estimates are based on these values.

Cancer Risk Estimates
Carcinogenic risks for the Slag Processing Area are discussed below.

Future Onsite Residents
Future onsite residents at the Slag Processing Area are evaluated for incidental ingestion of soil and dermal contact with soil when working or playing in their yards.

Carcinogenic COPCs selected for residential soil at the Slag Processing Area are:
- methylene chloride, and
- arsenic.

Total cancer risks for incidental ingestion of soil are 1.3E-05 and 1.7E-04 for average exposure and RME, respectively. Risks for this pathway are in the middle of EPA's (1990) acceptable range. Estimated cancer risks from dermal exposure to soil are less than EPA's (1990) acceptable range. Total cancer risk estimates for future onsite residents at the Slag Processing Area are almost entirely from incidental ingestion of soil. Total estimated cancer risks for RME are above EPA's (1990) acceptable range.

Future Onsite Commercial/Industrial Workers

Carcinogenic risks from ingestion of soil near the Slag Processing Area for the future onsite commercial/industrial worker scenario are within EPA's (1990) acceptable risk range.

Future Onsite Construction Workers

Total cancer risk estimates for future onsite construction workers at the Slag Processing Area from incidental ingestion of soil and dermal contact with soil are 7.2E-08 and 1.5E-06 based on average exposure and RME, respectively. These risks are below and at the bottom of EPA's (1990) acceptable range.

Current and Future Onsite Trespassers

Total cancer risk estimates for trespassers onto the Slag Processing Area are 1.5E-05 and 2.4E-05 based on average exposure and RME, respectively. Total cancer risk estimates are within EPA's (1990) acceptable range.

Noncarcinogenic Hazard Estimates

Noncarcinogenic health effects estimates at the Slag Processing Area are presented for future onsite residents, future onsite commercial/industrial workers, future onsite construction workers, and current and future onsite trespassers. Noncancer health effects for these scenarios are discussed below.

Future Onsite Residents

Total HIs for future onsite residents at the Slag Processing Area from incidental ingestion of soil and dermal contact with soil are 2.3 and 8.9 based on average exposure and RME, respectively. These risks are almost entirely from incidental ingestion of soil. Risks from dermal contact with soil are negligible. HIs for exposure to soil exceed unity, indicating that there may be a potential for adverse noncancer effects from exposure to soil for future onsite residents at the Slag Processing Area.

Future Onsite Commercial/Industrial Workers

Total HI estimates for incidental ingestion of soil and dermal exposure to contaminants in soil by future onsite commercial/industrial workers are less than unity, suggesting that adverse noncancer health effects from exposure to soil are not likely for future onsite commercial/industrial workers at the Slag Processing Area.

Future Onsite Construction Workers
The total noncarcinogenic HI for incidental ingestion of soil by future onsite construction workers is 1.1 for RME. Since the HI based on RME exceeds unity, adverse noncarcinogenic health effects may be associated with this pathway. The HIs for dermal exposure are less than unity, suggesting that adverse noncancer health effects from dermal exposure to soil are not likely for future onsite construction workers at the Slag Processing Area. The HI for the RME for the combined pathways exceeds unity, suggesting a potential for adverse health effects.

Current and Future Onsite Trespassers
HI estimates for incidental ingestion and for dermal exposure to contaminants in soil are less than unity. Adverse noncancer health effects are not expected for trespassers onto the Slag Processing Area. Since total HIs for this pathway are less than unity, adverse noncancer health effects are not expected for trespassers onto the Slag Processing Area.

Risks Associated with Exposure to Lead
The Slag Processing Area has mixed land use and is designated for residential and commercial/ industrial exposures. Receptors evaluated for potential exposure to lead in this source area are child residents, child trespassers, and adult workers.

The IEUBK model predicts that the risk of trespassers onto the Slag Processing Area having a blood lead level in excess of 10 µg/dL is 2.11 percent. This suggest that risks from exposure to lead at the Slag Processing Area are not likely for trespassers.

Adult exposure methodology predicts a 95 percentile fetal blood lead level of 7.74 µg/dL in women of childbearing age exposed to lead in soil at the Slag Processing Area. Excess risk for female workers at the Slag Processing Area is therefore not expected.

For future onsite residents at the Slag Processing Area, the IEUBK model was run in the batch mode. This approach uses each lead data point from this source area. The cumulative results of the batch mode run demonstrates that there is a 38.16 percent probability that the blood lead concentrations for children residing at the Slag Processing Area may be 10 µg/dL or greater. The results suggest that significant risk from exposure to lead in soil is expected for children who may reside at the Slag Processing Area.

Ecological Assessment
Ecological risks in the Slag Processing Area source area are due to chemical stressors identified in surface soil, however, slag materials in soil are also a significant physical stressor on vegetation. Nine contaminants of potential concern (COPCs) were identified in surface soil from the Slag Processing Area including 1 volatile and 8 inorganics (metals). Major contributors of risk for surface soil in the Slag Processing Area are chromium, zinc, and copper. These COPCs have relatively low background contributions, and represent high risks to American Robin with Hazard Quotients (HQ) of 21,664 (for chromium), 15,441 (zinc), and 12,800 (copper). Risks to robin were also high for lead (HQ = 2,343), however, it is not a major contributor to risk. With the exception of zinc which has 16 percent background contributions to COPC risk, risks from the COPCs are principally site-related. The estimated risk to the robin from cadmium is also significant, but contributions from background are 42 percent.